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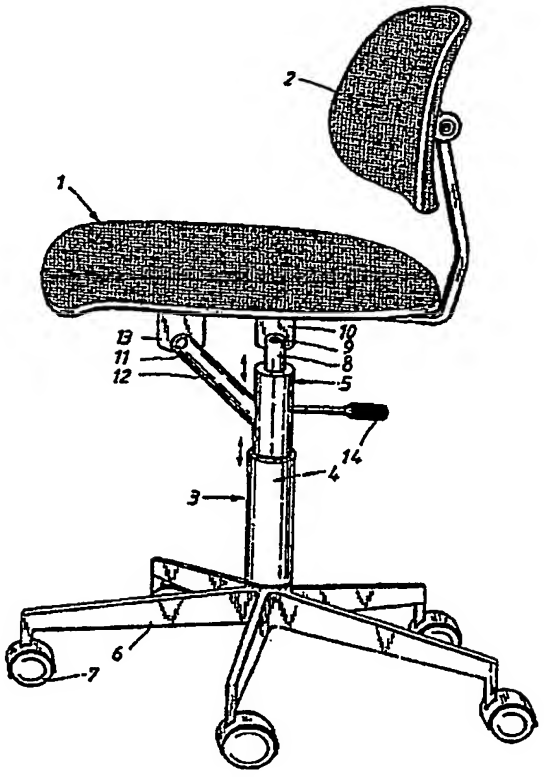
(54) Title: HYDRAULIC DEVICE FOR CHAIRS

(57) Abstract

The present invention relates to a hydraulic piston arrangement, preferably for use with reclinable and/or height-adjustable chairs. The seat (2) of the chair is acted on by a rod (8) which is connected to a piston (15). The piston is located in a liquid-filled space (16, 17) within at least one half (17) of which a compressible means (20) is arranged. In order to be able to adjust the device, the liquid communicates via a conduit (18) within which an adjustable valve (19) is provided.



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Title: Hydraulic device for chairs

Technical field

The present invention relates to a hydraulic piston arrangement, particularly for use in connection with tilting and/or height-adjustable chairs.

Background art

It is known to use hydraulic piston arrangements comprising an upper and a lower end-wall and a cylinder wall within which a movable piston is arranged that, in a sealed manner, bears against the cylinder wall such that an upper resp. a lower liquid-filled chamber is formed, a conduit which provides communication between said liquid-filled chambers, a resilient element which acts upon the piston with a certain force in a given direction and a force-transmitting member which is arranged on the piston and which sealingly penetrates one of said end-walls.

Technical problem

A general problem with such hydraulic piston arrangements is to maintain 100 percent safety with such a system yet still keep material costs at a reasonable level. This problem is brought about because the member which is attached to the piston displaces liquid within the cylinder chamber when it, together with the piston, is moved in the cylinder chamber. This displacement leads to an increased pressure (incompressible liquid) which strains the arrangement and is usually compensated for by overdimensioning.

Solution and advantages

The principle object of the present invention is to provide a hydraulic piston arrangement with a closed system comprising an incompressible liquid which need not be overdimensioned.

Said object is achieved by a hydraulic piston arrangement which has an elastic, compressible means provided in one of its liquid-filled chambers. Accordingly this compressible means can, through compression, compensate for the additional volume which the piston rod displaces whilst moving in the hydraulic cylinder, and in this way the pressure within the closed system can be maintained substantially constant.

A further object of the invention is to be able to additionally improve the comfort of chairs. This object is achieved through mounting such a hydraulic piston arrangement between a support column of the chair and its seat in order to provide the possibility of rocking and/or variable adjustment of the seat inclination.

Description of drawings

The invention shall be further described in the following with reference to the attached drawings in which

Fig. 1 shows in a schematic manner the invention in its preferred usage, namely mounted between a chair seat and its support column,

Fig. 2 schematically shows the principle of operation of a hydraulic piston arrangement according to the invention,

Fig. 3 shows a first preferred (the best) embodiment of the invention,

Fig. 4 shows a second embodiment of the invention and

Fig. 5 is a further schematic view of the invention.

In Fig. 1 there is accordingly shown a chair comprising a chair seat 1 and a backrest 2 attached thereto. The frame has a support column 3 within which, in a preferred instance, a telescopically movable piston arrangement 4 is provided (either a device according to the invention or some such previously known device). Fig. 1 further shows that between the upper end of the support column 3 and a mounting point 10 on the seat 1, a hydraulic piston arrangement 5 according to the invention is arranged. Via a pivot mechanism 9, in this case shown in Fig. 1, the force-transmitting member 8 of the piston arrangement can move the part 10 of the seat 1 up and down. The seat 1 is further supported at another point 13 via a pivot 11 and a lever 12 which is fixed to the upper telescopic part of the support column 3. Accordingly it is possible that the hydraulic piston arrangement 5 according to the invention can effect either the rocking about pivot point 11 or the fixing of the seat 1 in a certain inclined position. The functioning of the hydraulic piston arrangement 5 according to the invention is suitably attained via a manually operable member, such as a handle 14.

In Fig. 2 there is shown the principle construction of a hydraulic piston arrangement 5 according to the invention. It can be seen here that the arrangement comprises a closed liquid system within which a piston 15 with sealing means 22 is arranged, which divides a cylinder space into an upper 16 and a lower 17 liquid-filled chamber. These two liquid-filled chambers 16, 17 communicate with each other via a conduit 18. A force-transmitting member 8 is provided on the piston 15, which penetrates one of said liquid-filled chambers via sealing means 23 in order to be able to act on a device exteriorally of said hydraulic piston arrangement 5. Within one of said liquid-filled chambers 17 there is further provided a resilient element 21 which in this case is arranged to be able to

influence the force-transmitting member 8 to push out of said arrangement 5.

In addition, an elastic, compressible means 20 is provided within said liquid-filled chamber 17 which, via compression is intended to compensate for the additional volume which the force-transmitting member 8 necessitates through its encroachment in said liquid-filled chamber 16. In the shown example a valve 19 is also arranged in said conduit 18. This valve 19 is intended to be adjustable, preferably by manual means 14. Accordingly, throttling of said valve gives an increased flow resistance between the two liquid-filled chambers 16, 17. In addition, closure of the valve 19 provides a fixing of the piston in a certain position.

In Fig. 3 there is shown a preferred form of the invention in which a first embodiment of the hydraulic piston arrangement according to the arrangement is mounted in the upper end of a support column 3 (not shown) and is fitted with its upper end 37 against a corresponding receiving part 35 of a chair seat 1. It is evident that the arrangement is intended to be constructed from two circular end-walls 27, 28 which are arranged at the end of a cylindrical cylinder wall 26. Within this space, which is filled with liquid, a piston with sealing means 22 is provided so that two separated liquid-filled chambers 16, 17 are formed. Both these liquid-filled chambers 16, 17 communicate with each other via a conduit 18 which in this case consists of a tube 33 provided with two openings 24, 25. The one opening 24 is arranged in the upper chamber 16 and the other opening 25 is arranged in the lower chamber 17. In a preferred instance a valve 19 is also arranged in said conduit 18 which is provided with a notch hole 34 corresponding to the opening 25 in the lower chamber 17. Via movement of the valve 19 through physically actuation of its outer part 30, the aperture 34 can be displaced so that the communication between the two liquid-filled rooms 16, 17 is restricted or interrupted. Fig. 3 further shows that a resilient member 21 is provided in the lower chamber 17. In the shown example, the

resilient member 21 is a compression spring which accordingly acts on the piston 15 with an upwardly directed force. On the piston's upper surface 15 there is arranged a force-transmitting member 8, in this case a tube, which is provided at its upper end 36 with a spherical surface 37, which is intended to cooperate with a corresponding surface 35 provided on the chair seat 1. A seal 33 is arranged between the upper end-wall 27 and the force-transmitting member 8. In accordance with a specific feature of the invention, a compressible means 20 is provided in the lower chamber 17, which during a downward displacement of the piston 15 is compressed as a result of the force-transmitting member 8, during its downward movement, displacing a certain volume of incompressible liquid. This compressible means can either totally or partially comprise of an elastic material, for example neoprene, or comprise of a flexible layer (thus not necessarily elastic) which embraces an elastic, compressible means, for example air.

Fig. 3 additionally shows that the piston arrangement is equipped with a centrally located guide 29 which in this case consists of a tube. If it is desired to provide this tube 29 with a closure (cap) 40, than this closure must be provided with an air hole 41 in order to compensate for the change in volume within the tube 8 during this movement.

Fig. 4 shows a second embodiment of the invention where the valve 19 no longer comprises of a displaceable valve, but of a rotatable valve. Accordingly in this case the flow between the two chambers 16 and 17 can be influenced by turning the outer body 30 of the valve 19. Fig. 4 also shows the flow direction of the liquid within said conduit 18 in the case when the piston 15, together with the force-transmitting member 8, moves in the direction given by the arrow "A". Accordingly in this case, liquid flows in through the upper hole 34, down through the conduit 18, out through the hole 34 in the valve 19, further through the hole 25 in the tube 33, and into the chamber 17 where, with such a movement, the compressible body 20 decompresses since the change in volume brought about by the

force-transmitting member 8 in this case diminishes. It should be noted that in this case the body 20 contributes with a spring force to bring the piston 15 in its upwardly directed movement.

Fig. 5 shows a further embodiment of a piston arrangement according to the invention. As a difference between the embodiments shown in Fig. 3 and 4, there is here shown a valve 18 which can consist of an annular space. Accordingly within the cylinder wall 26 there is provided an additional tubular shaped part 33' which delimits said annular space between it and the cylinder wall 26. The piston 15 bears upon the tube's 33' inner wall which has a smaller diameter in relation to the earlier embodiment. The valve 19 is simply shown schematically, but has the same function as the above-described and its action can consequently be regulated through the influence of an operating member 30. It is further shown that the compressible means can be shaped as an annulus 20. There are certain technical advantages with the embodiment shown in Fig. 5. Amongst them is that it is not necessary to drill an eccentric hole in the piston 15, at the same time that the sealing surface is simplified.

The skilled man will realize that the invention is not to be restricted to the above-described, but can be modified within the scope of the patent claims.

Accordingly it is for example possible to use various configurations of the cylinder resp. piston, such as rectangular. Furthermore it is to be understood that if merely the rocking function is required, a valve arrangement is superfluous if the rocking resistance is not to be variable. In addition it lies within the scope to use various types of spring elements, i.e. both pressure and tension springs which are not restricted to helical springs since cup springs etc. are also imaginable.

Claims

1. Hydraulic piston arrangement (5) comprising an upper and a lower end-wall (27 resp 28) and a cylinder wall (26) within which a movable piston (15) is arranged which, in a sealed manner (22), bears against the cylinder wall (26) such that an upper (16) resp. a lower (17) liquid-filled chamber is formed, a conduit (18) which provides communication between said liquid-filled chambers (16, 17), a resilient element (21) which acts upon the piston (15) with a certain force in a direction and a force-transmitting member (8) which is arranged on the piston and which sealingly (23) penetrates one of said end-walls (27, 28), c h a r a c t e r i z e d i n that an elastic, compressible means (20) is arranged in one of said liquid-filled chambers (16, 17).

2. Piston arrangement according to claim 1, c h a r a c - t e r i z e d i n that said liquid-filled chambers communicate with each other via an adjustable valve (19).

3. Hydraulic piston arrangement according to claim 1, c h a r a c t e r i z e d i n that said conduit comprises a tube (33) arranged within said cylinder wall (26).

4. Hydraulic piston arrangement according to claim 1, c h a r a c t e r i z e d i n that said arrangement is intended to be arranged on a chair, between its support column and is seat (1), so as to provide the possibility of rocking and/or variable adjustment of the seat inclination.

5. Hydraulic piston arrangement according to claim 4, c h a r a c t e r i z e d i n that said force-transmitting member (8) is provided with an upper spherical surface (37),

which surface is intended to cooperate with a second spherical surface (35) arranged on the underside of said seat (1).

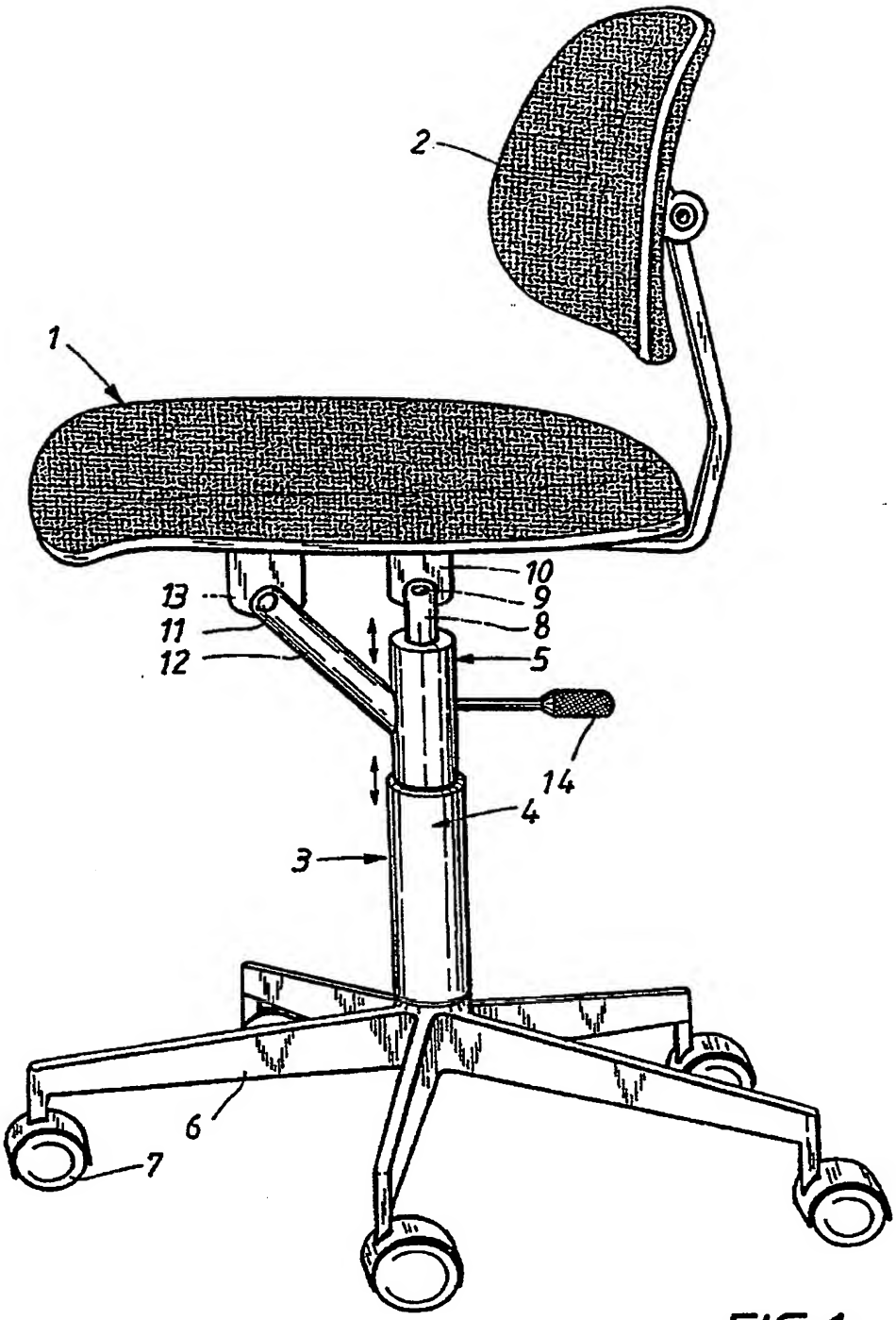

FIG.1

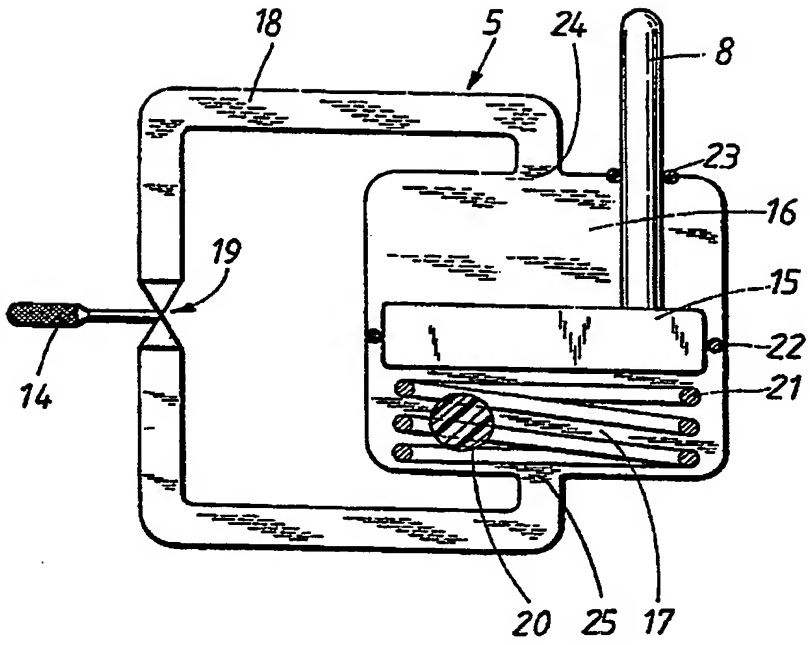

FIG. 2

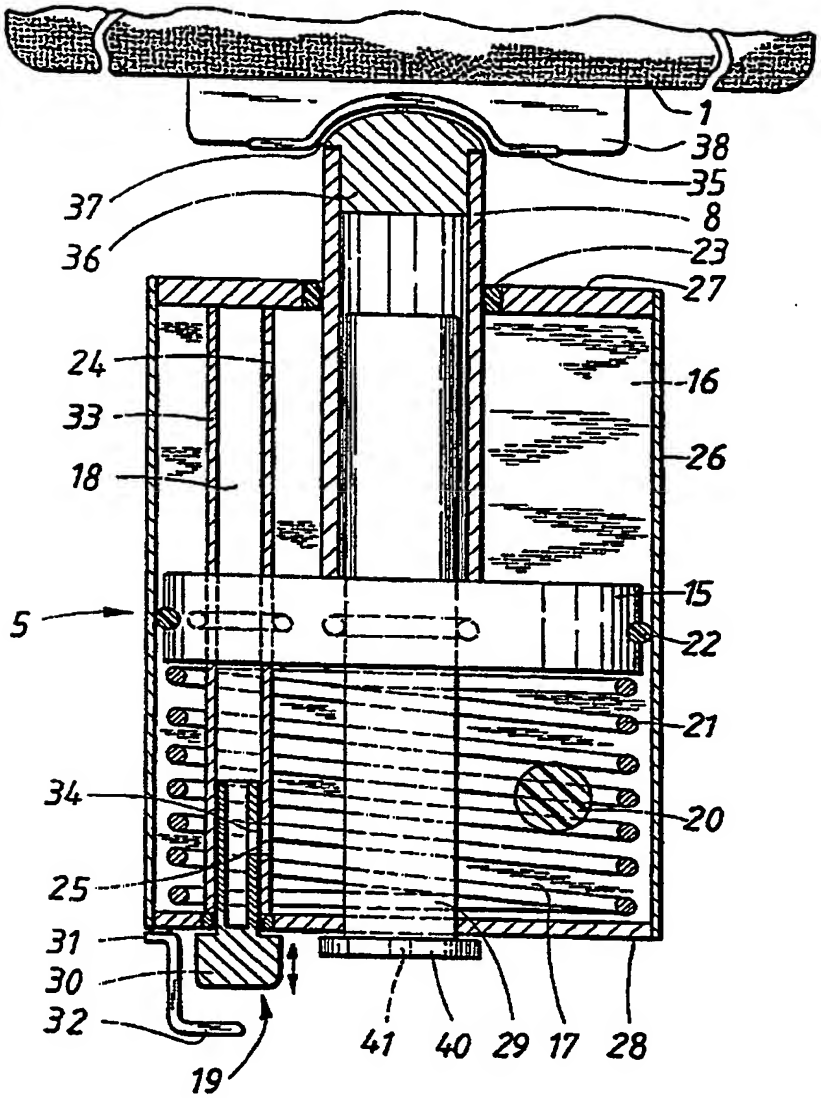
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FIG.3

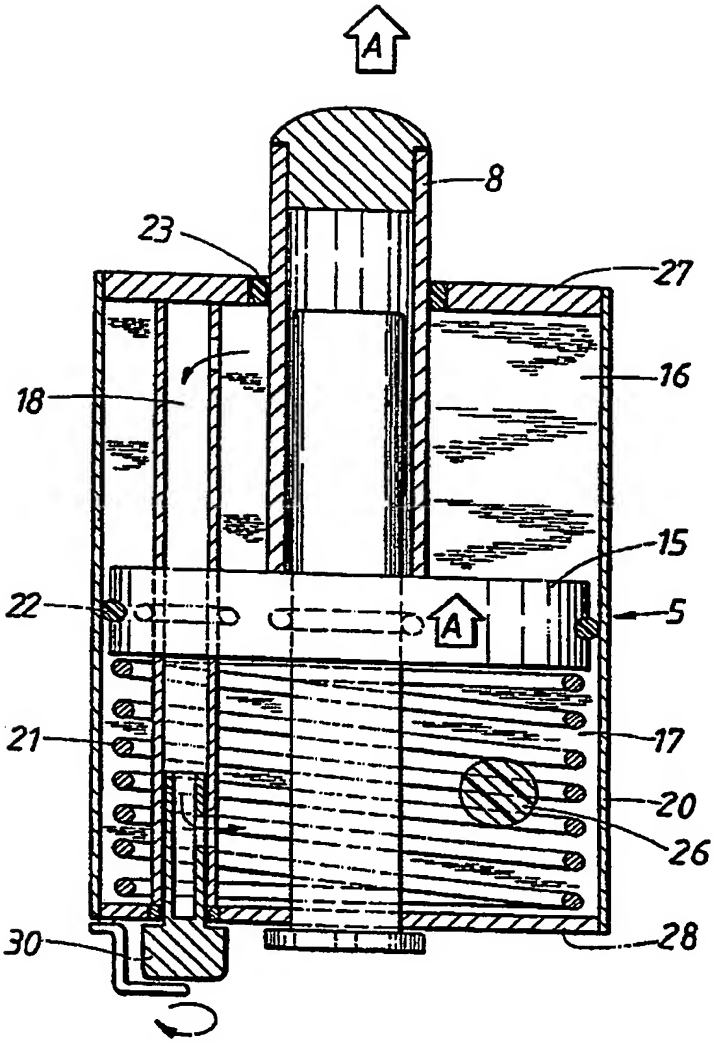

FIG. 4

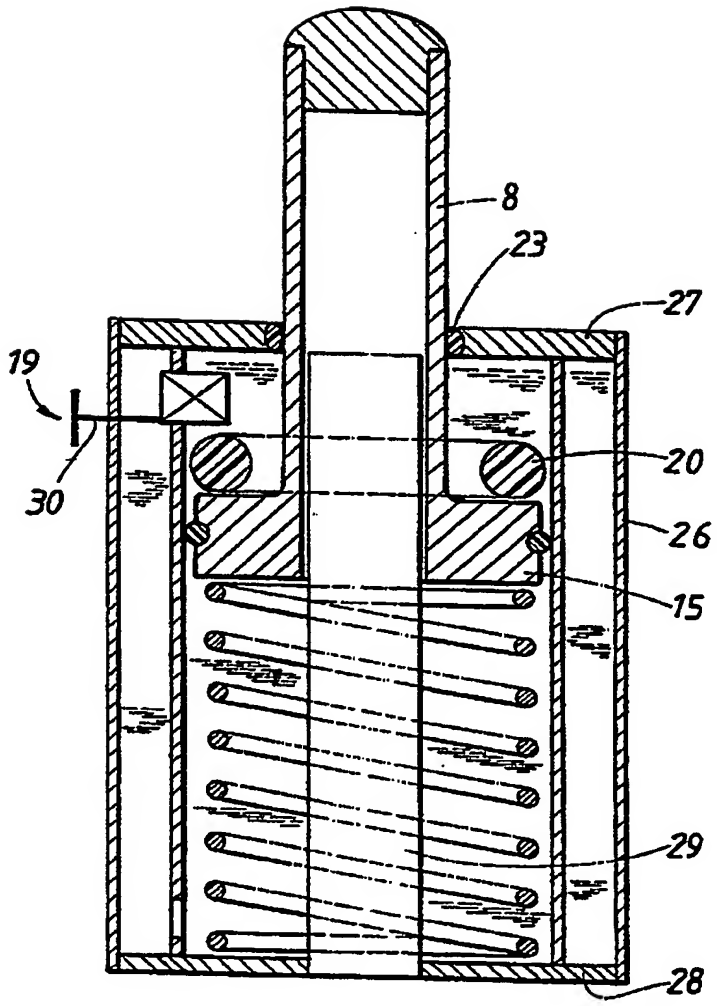

FIG.5

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00235

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: F 16 F 9/44, A 47 C 3/026

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	F 16 F; A 47 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	US, A, 4732244 (VERKUYLEN) 22 March 1988, see the whole document	1-3
Y	--	4
X	US, A, 3788433 (KATSUMORI) 29 January 1974, see the whole document	1
Y	--	4
X	DE, A, 2134365 (BAUER, FRITZ) 18 January 1973, see the whole document	1
Y	--	4
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
9th July 1990	1990 -07- 12
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	P-O Varnbo

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 90/00235

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4732244	88-03-22	EP-A-B- 0237085	87-09-16
		JP-A- 62215138	87-09-21
		NL-A- 8600211	87-08-17
US-A- 3788433	74-01-29	NONE	
DE-A- 2134365	73-01-18	NONE	
EP-A- 0030806	81-06-24	NONE	